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Engineering Archaeological Services Ltd.

Ysgol Treferthyr, Criccieth, Gwynedd:
Geophysical Survey

Commissioned by

Alan Edwards,
Adran Tai ac Eiddo, Cyngor Gwynedd

Analysis by

I.P. Brooks

Engineering Archaeological Services Ltd

EAS Client Report 2021/08

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List of Illustrations

NGR

Centred on: SH 49233 38036

Location and Topography (Figures 1 and 2)

The survey area lies at the western edge of the built-up area of Criccieth, Gwynedd; It is south of the A497, west of Lon Fel and north of the railway. The eastern side of the development area is under semi-mature woodland and is fenced off as a separate plot. West of the woodland the land has the appearance of parkland with a series of mature oaks within a pasture. The oaks concentrate along the western side of the development, partly along a drainage channel or seasonal stream. In the south west corner of the development area is an area of reedy vegetation suggesting this part of the field is waterlogged at times of the year.

Near to the southern boundary is a single standing stone. Aeon Archaeology (Cooke 2019, 28) records this stone as having apparent drill marks on its eastern face suggesting it is a relatively modern feature.

In general, the ground slopes gently down to the south, but with the occasional diffuse earthworks which are assumed to be natural.

Archaeological Background

Gwynedd County Council plan to build a new school on the site (Planning Reference C21/0718/41/LL). Previously they commissioned Aeon Archaeology (Cooke 2019) to produce a desktop study of the proposed development which looked at a larger area including a second field immediately to the west of the survey area. The study defined a number of potential archaeological features within the development area including fifteen archaeological sites within, or in close proximity to the site boundary. Of particular note is the former driveway to Muriau (GAT PRN: 81364) which crosses the survey area from south to north. Also, the 1839 tithe map suggests a serpentine water course crosses the surveys area as does a series of field boundaries which are also shown on 1831 Ordnance Survey map.

In his response to the Gwynedd Planning Committee, Tom Fildes (Planning archaeologist at the Gwynedd Archaeological Planning Service) states that “the periphery of the town does hold potential for unknown archaeological sites. The Tithe Map suggests early variations on the field’s composition, as well as being in proximity to an early (possibly even Medieval) farmstead to the south. The route of the A497 is the route of the original track in and out of Criccieth to the west, meaning that roadside sites such as this hold particular potential for associated activity.” (https://amg.gwynedd.llyw.cymru/planning/index.html?fa=getApplication&id=32054). As a result of these recommendations the current Fluxgate Gradiometer survey was commission by Alan Edwards, Property Development Officer for Adran Tai ac Eiddo, Cyngor Gwynedd

Aims of Survey

1. To record any geophysical anomalies within the survey area which may be related to archaeological activity.

SUMMARY OF RESULTS

A Fluxgate Gradiometer Survey was undertaken between the 15th and 16th September 2021 on the site of the proposed new school at Criccieth. The magnetic susceptibility samples suggest the area is not particularly suitable for magnetic survey. However, several magnetic anomalies were located within the survey, the majority of which appear to relate to the either modern disturbance or the parkland landscape. The drive to Muriau has been located as a magnetic anomaly, however, other boundaries shown on the historic mapping of the area were not detected. A group of anomalies in the north east section of the survey, however, show a level of archaeological activity in this part of the field. The origins of these anomalies are not certain, but it may relate to activity along the road running west from Criccieth, now the A497.

Cynhaliwyd Arolwg Graddiomedr Fluxgate rhwng y 15fed a'r 16eg o Fedi 2021 ar safle'r ysgol newydd arfaethedig yn Criccieth. Mae'r samplau tueddiad magnetig yn awgrymu nad yw'r ardal yn arbennig o addas ar gyfer arolwg magnetig. Fodd bynnag, cafwyd hyd i sawl anghysondeb magnetig yn yr arolwg, ac ymddengys bod y mwyafrif ohonynt yn ymwneud â'r aflonyddwch modern neu'r dirwedd parcdir. Mae'r trac i Muriau wedi'i leoli fel anghysondeb magnetig, fodd bynnag, ni chanfuwyd ffiniau eraill a ddangosir ar fapio hanesyddol yr ardal. Mae grŵp o anghysonderau yn rhan ogledd-ddwyreiniol yr arolwg, fodd bynnag, yn dangos lefel o weithgaredd archeolegol yn y rhan hon o'r cae. Nid yw gwreiddiau'r anghysonderau hyn yn sicr, ond gall ymwneud â gweithgaredd ar hyd y ffordd sy'n rhedeg i'r gorllewin o Criccieth, yr A497 bellach

Methods

The survey was based on a series of thirty, 20 x 20 m squares laid out as in Figure 2. Readings were taken with a Geoscan FM256 Fluxgate Gradiometer at 0.25 m intervals along transects 1 m apart. The surveys were downloaded onto a laptop, on site, and processed using Geoscan Research “Geoplot” v.4.00. The X - Y plots were produced by exporting the data and processing it using Golden Software “Surfer” v. 10.7.972

A limited number of soils samples were taken to access the Magnetic Susceptibility on the site (Figure 7). These were dried out in a warming oven, sieved and processed using a Bartington MS2 Magnetic Susceptibility Meter.

Survey Results:

Area

1.13 Ha

Display

The results are displayed as grey scale images (Figures 3 and 4) and as a X-Y trace plot (Figure 5). The interpretation plot is shown as Figures 6. The Magnetic Susceptibility results are summarised on Figure 8 and the survey, as a whole, is summarised on Figure 9.

Results:

Fluxgate Gradiometer Survey

The grey scale plot (Figure 3) has a relatively large range of values which results in one standard deviation of the readings running between -16.95 and +16.59 nT. This has the tendency to flatten the plot, obscuring some of the less distinct anomalies. However, plotting the same data at ± 5nT (Figure 4) allows for the feint anomalies to be determined.

Five ferromagnetic anomalies have been defined, which are shown in blue on Figure 6. Anomalies A, B and C are along the retaining wall defining the southern side of the A497. A plastic waterpipe runs along this line, however, it is unlikely that a plastic pipe would give rise to a ferromagnetic response. Anomaly B can be directly related to the stay for a telegraph pole, but it is likely that Anomalies A and C relate to metal within the topsoil, probably modern rubbish dumped along the edge of the field. Anomaly D is an area of ferromagnetic response along the southern boundary of the proposed development area. It is possibly the result of a metal pipe running along this boundary. A similar anomaly (Anomaly E) at the southernmost point of the survey is possibly an extension of Anomaly D; however, it is also possible that the proximity of the mobile phone mast and its control cabin may also have given rise to this anomaly.

There are nine areas of magnetic disturbance in the south western half of the survey (Anomalies F – N). These can be conveniently divided into two groups based on their shape and magnetic profiles. Anomalies F, G M and N are of a similar form with a near circular, or oval shapes, containing a mixed magnetic signature. The vary in size between 9.4 x 10.3 m (Anomaly F) and 4.9 x 5.6 m (Anomaly N) and are the sort of magnetic anomaly that are commonly associated with lost trees within the landscape, often those in which the stumps have been partly burnt out. The other group (Anomalies H, I, J, K and L) have less defined shapes, but have readings that vary considerably between, up to, -200 nT and +55 nT. The origins of these anomalies are uncertain; however, it is possible that they represent areas of burning. A somewhat diffuse anomaly (Anomaly O) crosses the western half of the survey running approximately north-south. It forms a band approximately 5 m wide of values varying between -12 and +6 nT. It is likely that this anomaly marks the position of is the former driveway to Muriau (GAT PRN: 81364) which is shown on the historic Ordnance Survey mapping of the area.

The north eastern corner of the plot shows a series of anomalies (Anomalies P – X) which form a distinct group unlike the character of the rest of the grey scale plot. Made up, largely, of a series of linear anomalies, the group is delineated by Anomalies Q and P which appear to define an enclosure at least 59 x 47 m in size which appears to be aligned alongside the line of the A497. The internal structure of this possible enclosure is difficult to determine with a fan of linear anomalies (Anomalies S, T, U and V) spreading out from an area of magnetic disturbance (Anomaly X) approximately 8 x 9.5 m in size. Two other linear anomalies (Anomalies R and W) form a rough right angle in the north west corner of the anomaly group.

Magnetic Susceptibility (Figure 7 - 8)

Sixteen, small, soil samples were taken for Magnetic Susceptibility analysis. It was not possible, however, to obtain a subsoil sample for comparison. Both volume susceptibility (direct reading of the samples) and mass susceptibility (reading compensated for the varying

mass of the samples) is given below. The location of the samples is shown on Figure 7 and the results on Figure 8.

Sample	Volume susceptibility χ_v	Mass susceptibility χ_m
1	13	19.0
3	9	13.7
5	12	18.7
7	11	17.2
9	21	32.7
11	12	18.6
13	13	19.1
15	14	21.3
17	59	80.7
19	21	31.0
21	13	17.9
22	60	95.4
24	22	32.2
26	15	26.5
28	120	164.4
30	33	56.1

The samples, as measured, are generally of low values suggesting that, the conditions for magnetic survey were not ideal.

Assuming a consistent geological regime across the survey area the magnetic susceptibility can be used as a proxy for the level of archaeological activity (Clark, 1996, 99). It is noticeable that the grid squares in the north west corner of the survey have considerably higher values than the rest of the survey. These can be related to the concentration of anomalies (Anomalies P – X) confirming the increased level of archaeological activity in this part of the site.

Conclusions (Figure 17)

It is a fundamental axiom of archaeological geophysics that the absence of features in the survey data does not mean that there is no archaeology present in the survey area only that the techniques used have not detected it.

The magnetic susceptibility samples suggest that this area is not particularly suitable for magnetic survey, however, the grey scale plots suggests that the survey area can be divided into two broad areas. The majority of the survey area has a series of anomalies that can be related to relatively modern activity with the drive to Muriau and a series of diffuse anomalies which are probably related to the removal of trees from the landscape. The relationship between the standing stone in the field and Anomaly O (the drive from Muriau) is noticeable possibly suggesting that the standing stone is either a gate post or has been placed after the drive went out of use.

In the north east corner, however, are a series of anomalies which suggest significant archaeological activity, probably alongside the road which was to become the A497. None of

this activity appears on the historic mapping suggesting it took place before 1831. The date of theses anomalies is not known. Their form is fairly angular and their location adjacent to the road may suggest they are not prehistoric in origins, but probably are medieval or post-medieval in date.

References

Clark, A. 1996. *Seeing beneath the soil prospecting methods in archaeology.* Routledge, London

Cooke, R. 2019. Proposed New School Site, A497 / Stryd Fawr, Cricieth, Gwynedd LL52 0RY *Aeon Archaeology Report 0211*

Acknowledgements

This survey was commissioned by Alan Edwards, Property Development Officer for Adran Tai ac Eiddo, Cyngor Gwynedd and was monitored for the Gwynedd Archaeological Planning Service by Tom Fildes. The CAD version of the background map was provided by Jorge Reynolds, Architectural Assistant with Ainsley Gommon Architects.

Techniques of Geophysical Survey:

Magnetometry:

This relies on variations in soil magnetic susceptibility and magnetic remanence which often result from past human activities. Using a Fluxgate Gradiometer these variations can be mapped, or a rapid evaluation of archaeological potential can be made by scanning.

Resistivity:

This relies on variations in the electrical conductivity of the soil and subsoil which in general is related to soil moisture levels. As such, results can be seasonally dependant. Slower than Magnetometry this technique is best suited to locating positive features such as buried walls that give rise to high resistance anomalies.

Resistance Tomography

Builds up a vertical profile or pseudo-section through deposits by taking resistivity readings along a transect using a range of different probe spacings.

Magnetic Susceptibility:

Variations in soil magnetic susceptibility occur naturally but can be greatly enhanced by human activity. Information on the enhancement of magnetic susceptibility can be used to ascertain the suitability of a site for magnetic survey and for targeting areas of potential archaeological activity when extensive sites need to be investigated. Very large areas can be rapidly evaluated and specific areas identified for detailed survey by gradiometer.

Instrumentation:

1. Fluxgate Gradiometer - Geoscan FM256

2. Resistance Meter - Geoscan RM15

3. Magnetic Susceptibility Meter - Bartington MS2

4. Geopulse Imager 25 - Campus

Methodology:

For Gradiometer and Resistivity Survey 20m x 20m or 30m x 30m grids are laid out over the survey area. Gradiometer readings are logged between 0.25m and 1m intervals along traverses 1m apart. Resistance meter readings are logged at 0.5m or 1m intervals. Data is down-loaded to a laptop computer in the field for initial configuration and analysis. Final analysis is carried out back at base.

For scanning transects are laid out at 10m intervals. Any anomalies noticed are where possible traced and recorded on the location plan.

For Magnetic Susceptibility survey, a large grid is laid out and readings logged at 20m intervals along traverses 20m apart, data is again configured and analysed on a laptop computer.

Copyright:

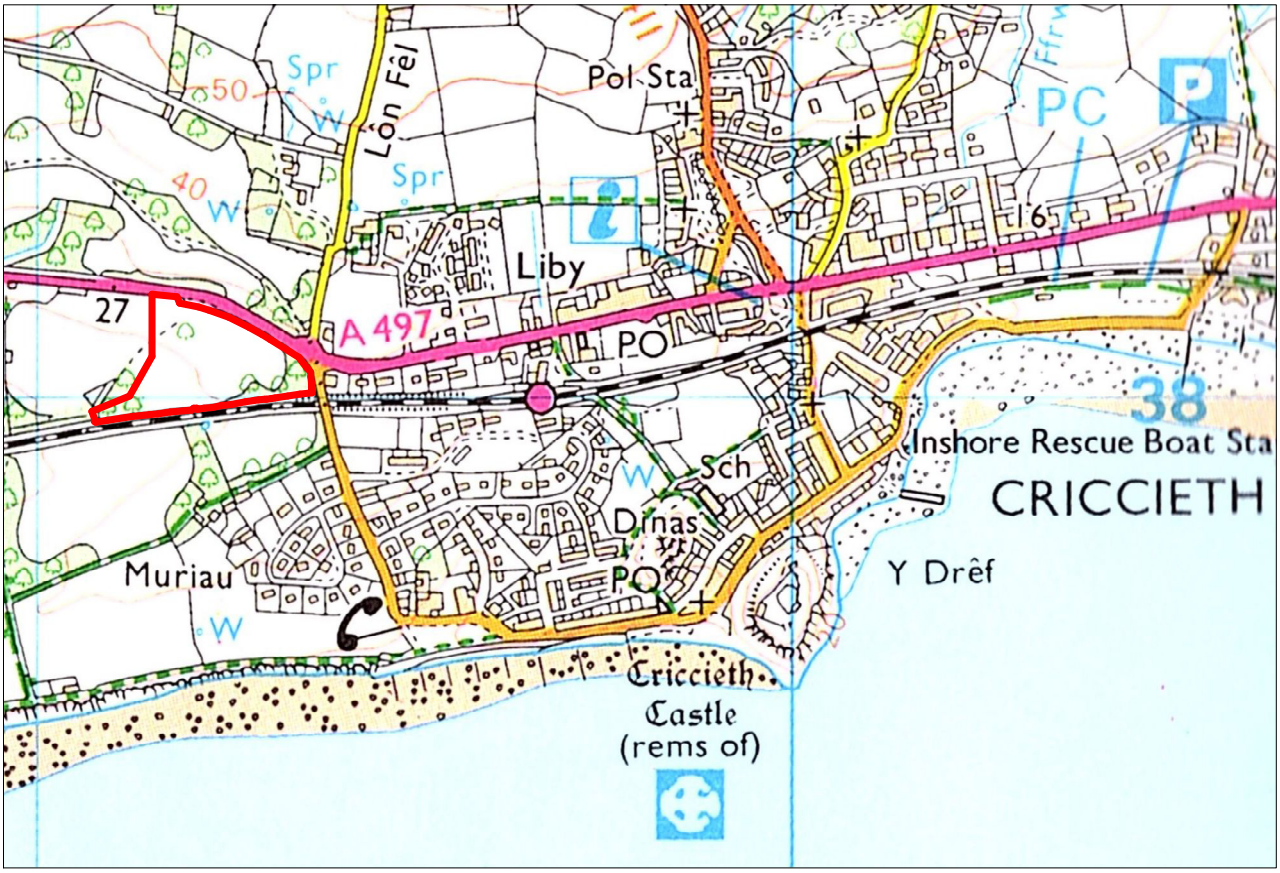
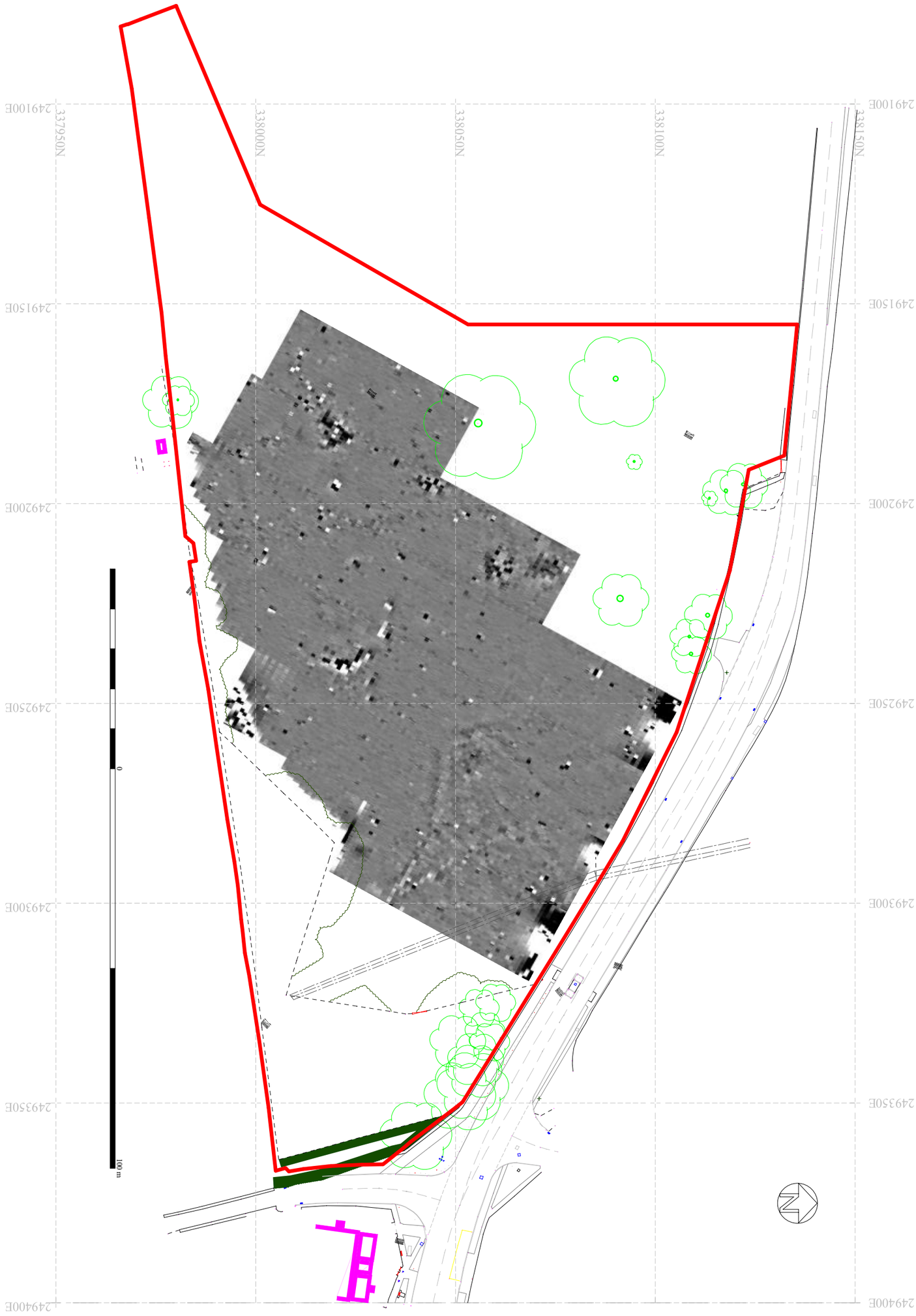


Figure 1: Location
Scale 1:10,000



Based on Drawing 10_080/01
by Curvasure Limited

Figure 2: Location of the Survey
Scale 1:1,000

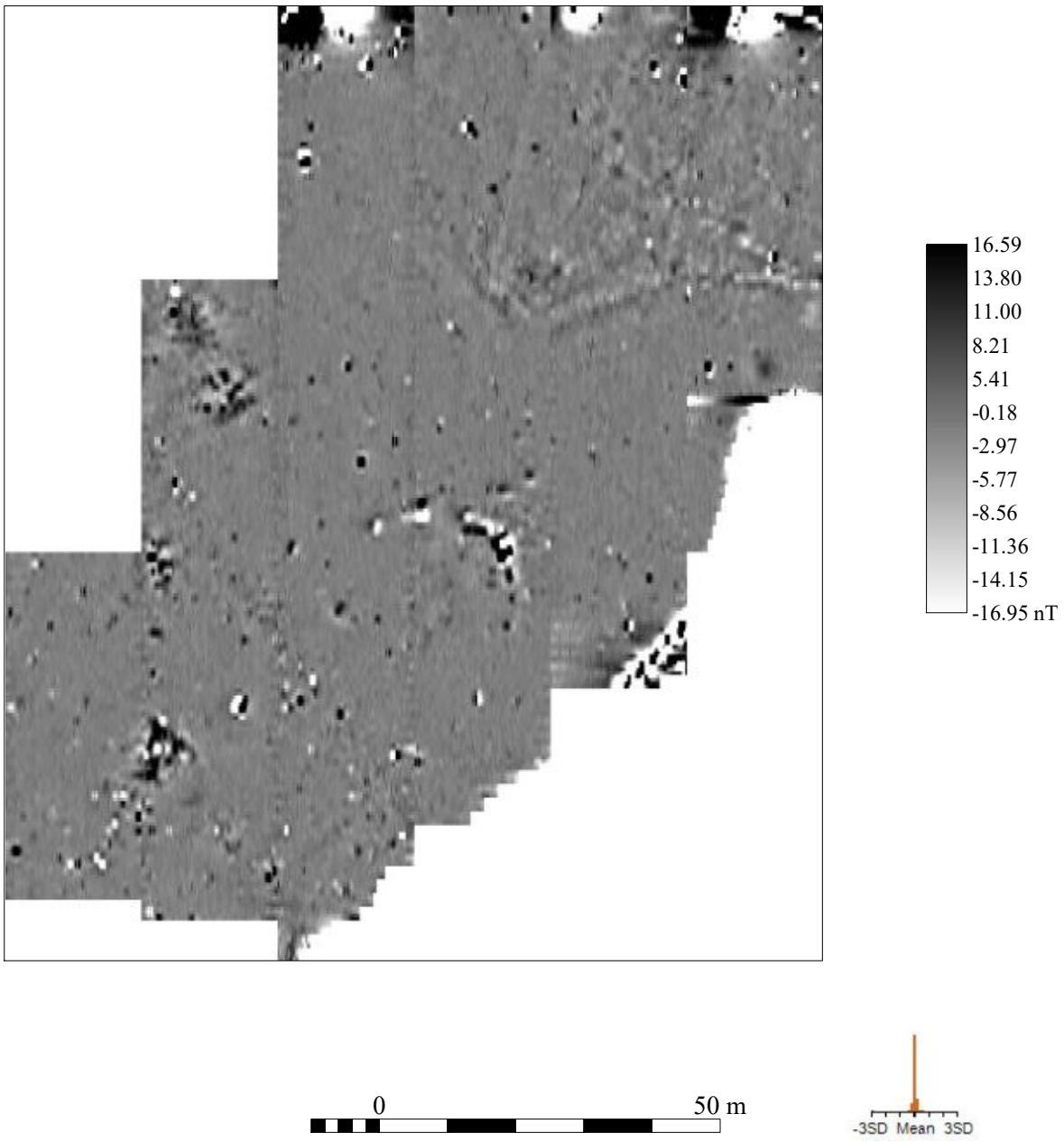


Figure 3: Grey Scale Plot at ± 1SD
Scale 1:1,000

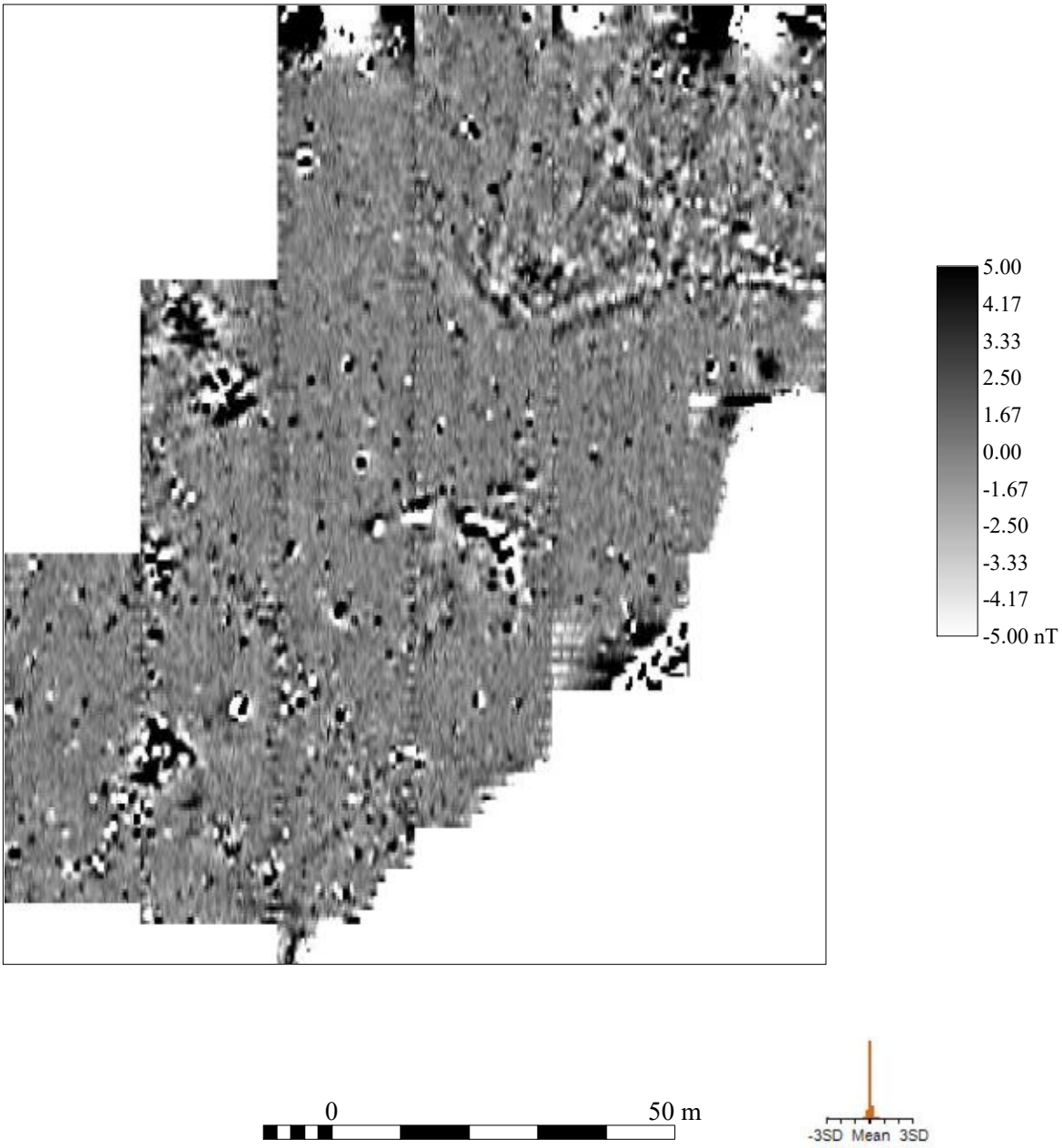


Figure 4: Grey Scale Plot at ± 5 nT
Scale 1:1,000

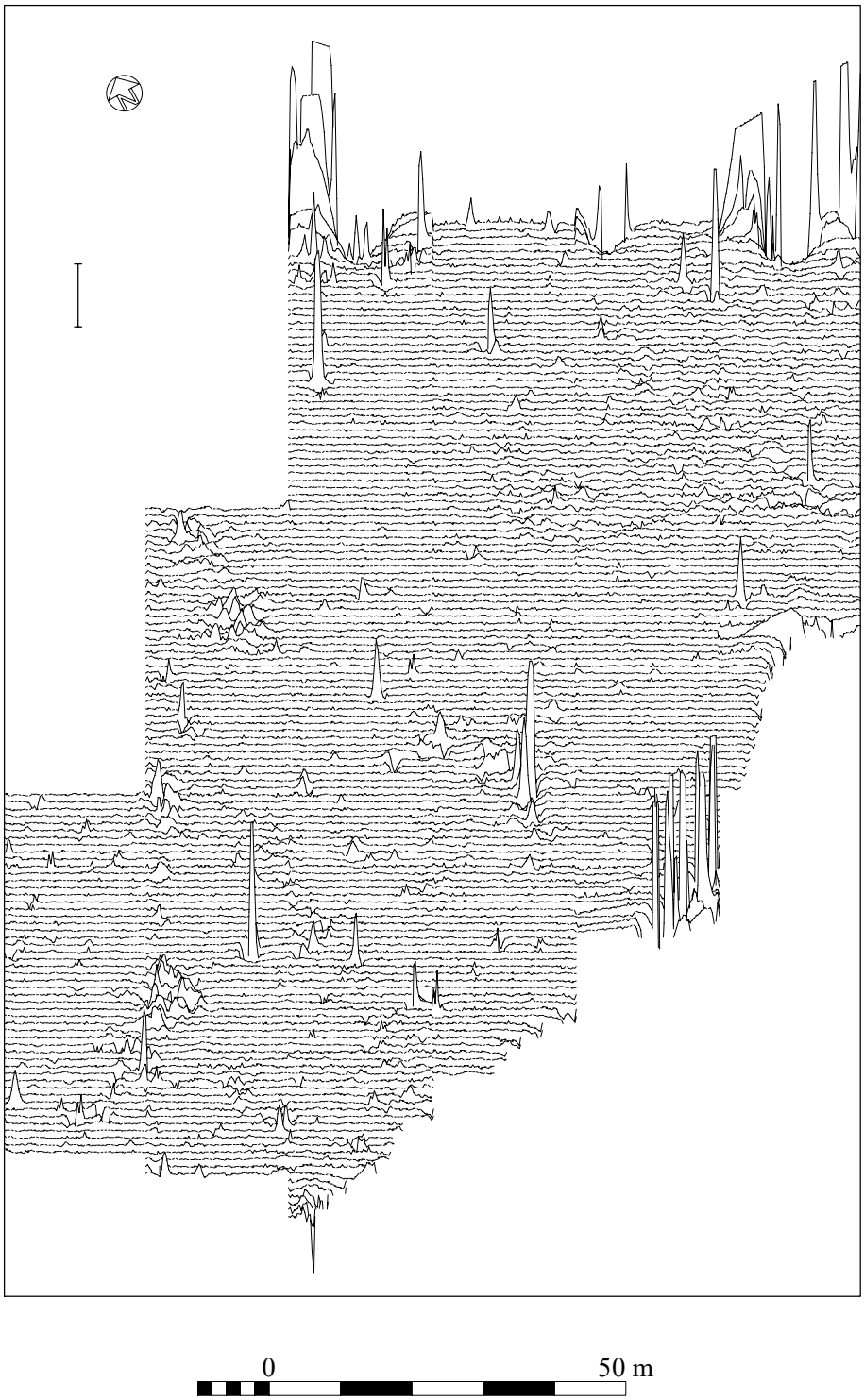


Figure 5: X-Y Plot
Scale 1:1,000

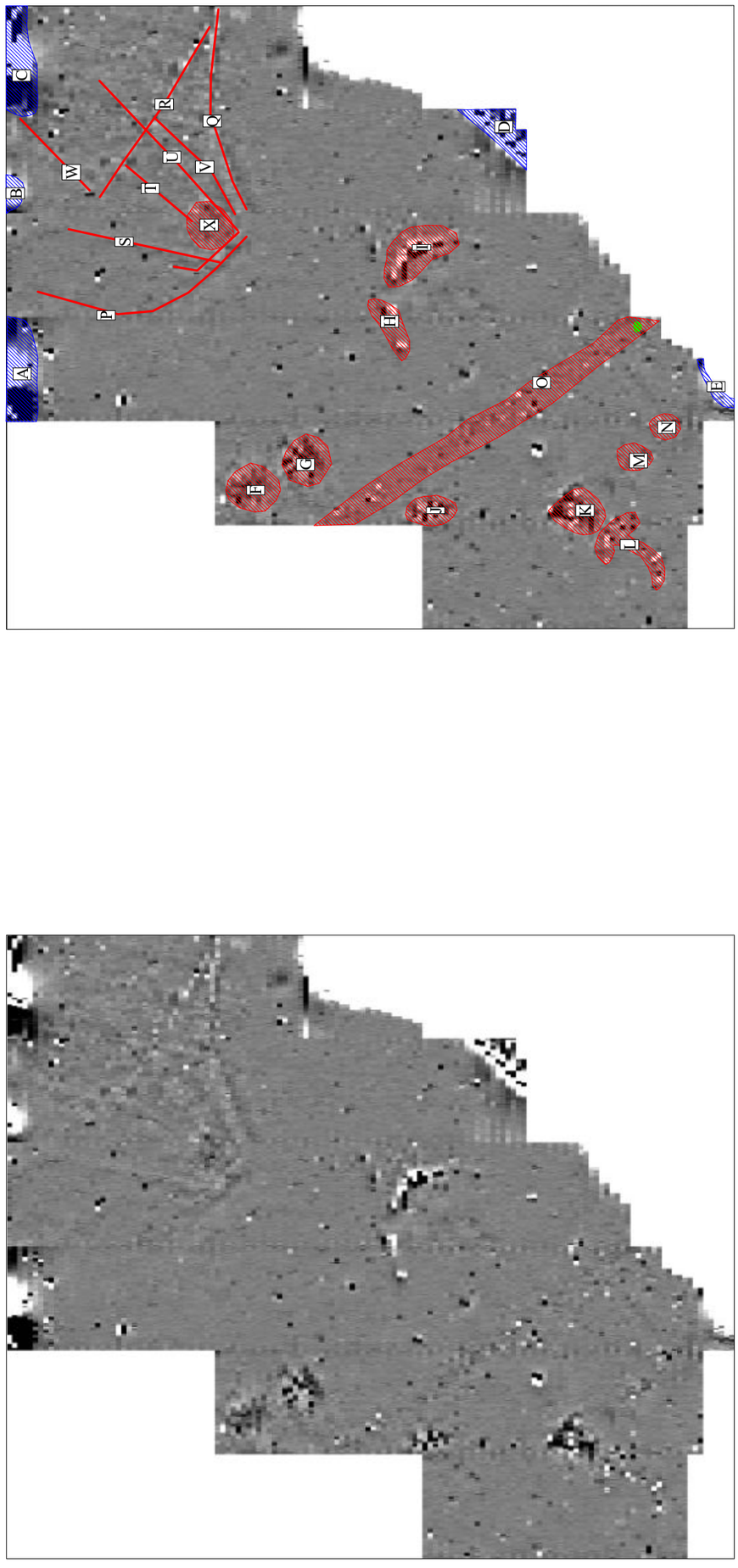


Figure 6: Interpretation
Scale 1:1,000

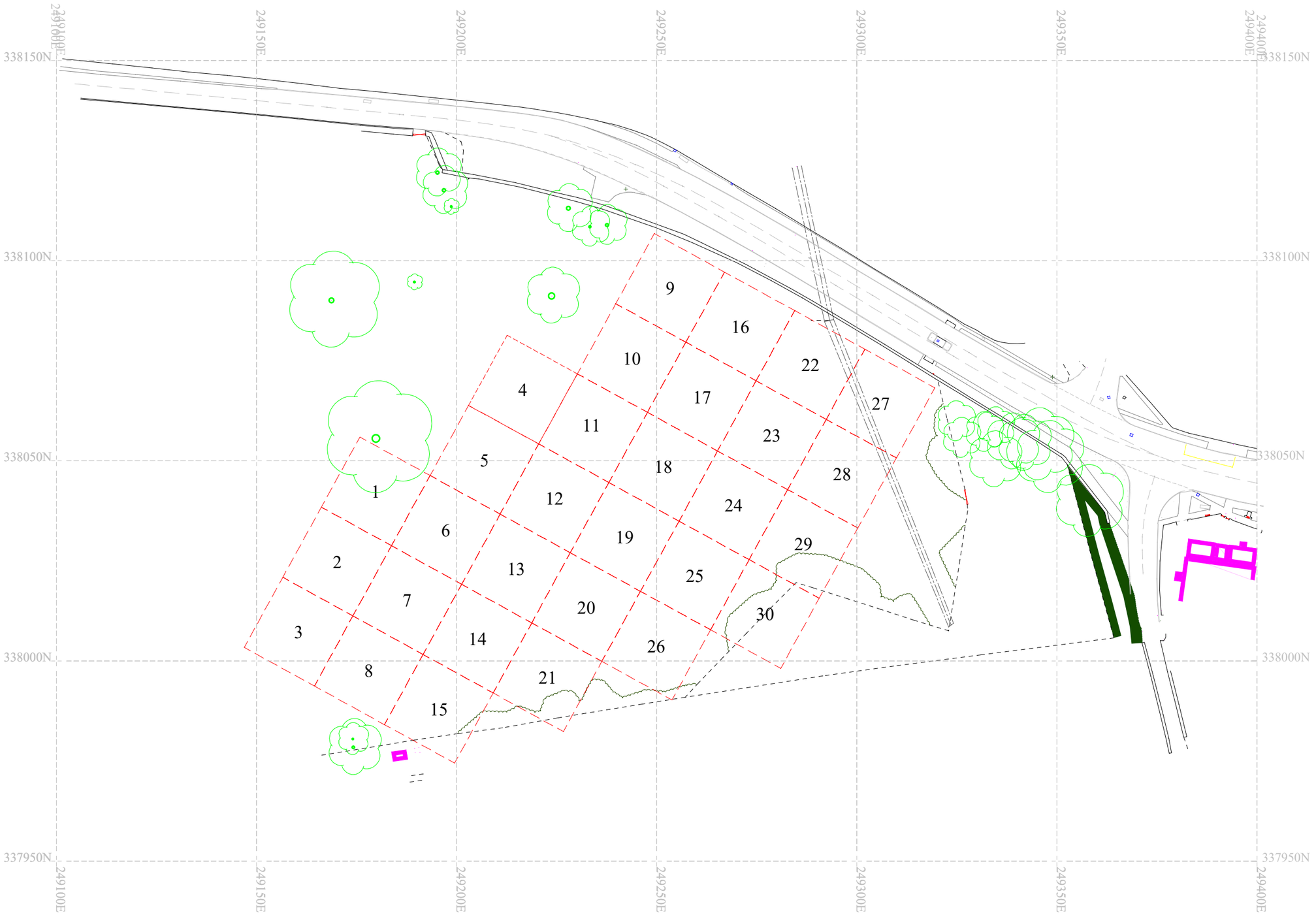


Figure 7: Location of the magnetic Suceptibility Samples
Scale 1:;1000

Based on Drawing 10_080/01
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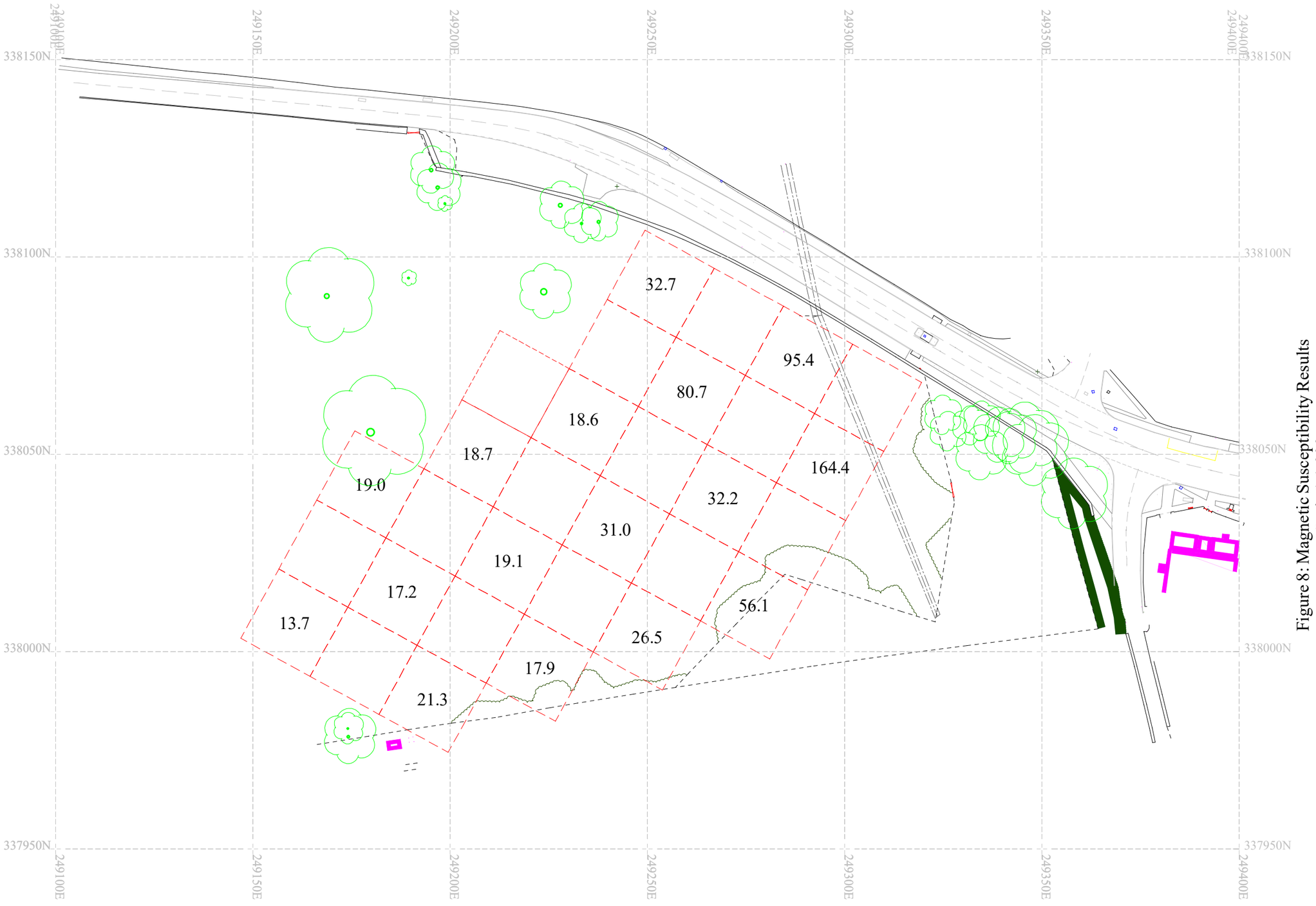

Figure 8: Magnetic Susceptibility Results
Scale 1:1,000

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by Curvasure Limited

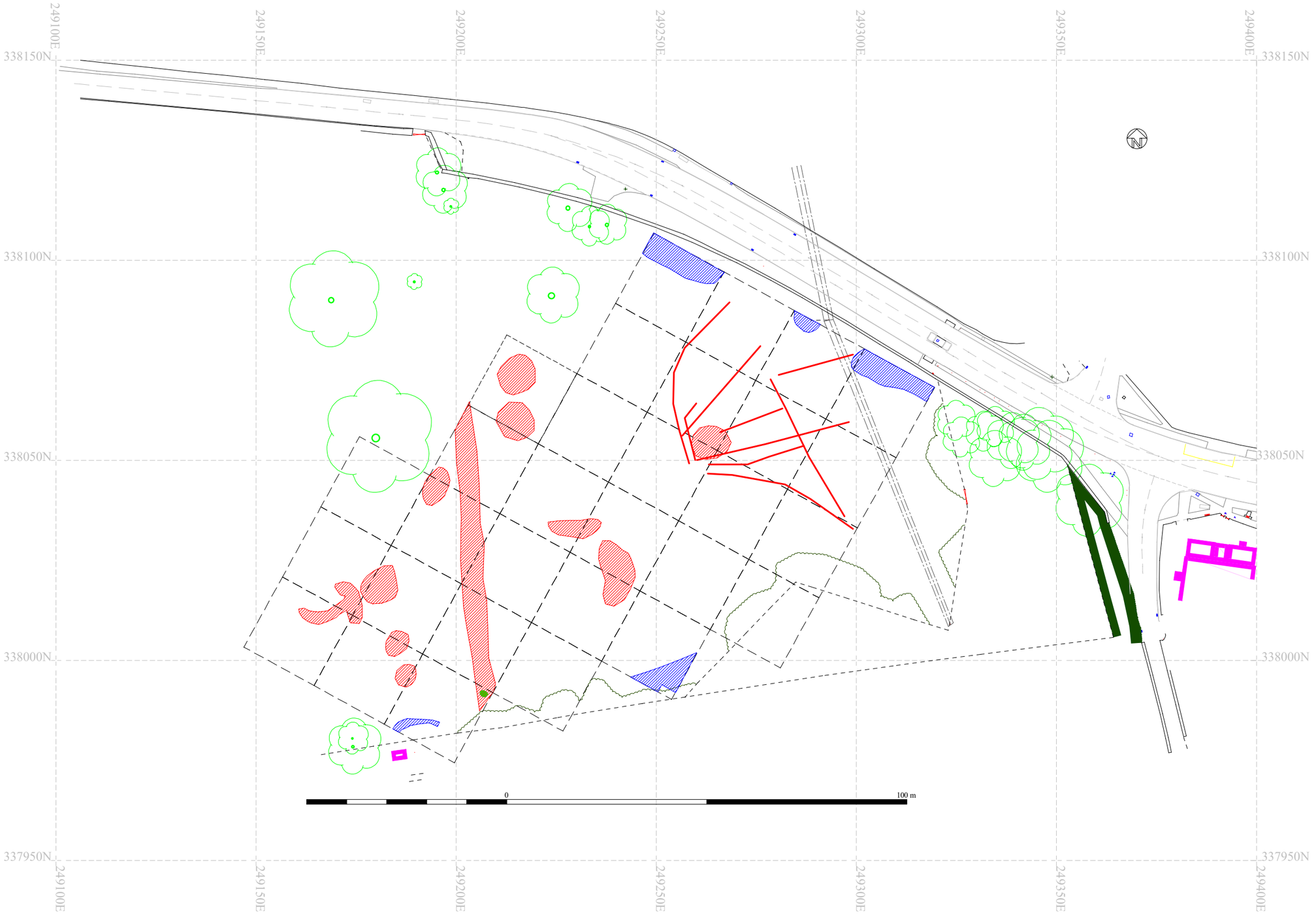

Figure 9: Summary
Scale 1:1,000

Based on Drawing 10_080/01
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Appendix 1: Specification for an Archaeological Geophysical on the site of a new school at Ysgol Treferthyr, Criccieth, Gwynedd. (Planning Reference C21/0718/41/LL)

Compiled by I.P. Brooks 16/06/2021

1. Non-Technical Summary

1.1. Gwynedd County Council plan to build a new school on land opposite Bron Eifion Lodge, Criccieth, LL52 0RY (Figure 1). As part of the archaeological evaluation of the site they have commissioned a Fluxgate Gradiometer survey of the site

2. Background

2.1. Gywnedd County Council plan to build a new school on land opposite Bron Eifion Lodge, Criccieth, LL52 0RY (Figure 1), Planning Reference C21/0718/41/LL

2.2. They have previously commissioned an archaeological desktop study from Aeon Archaeology (Cooke 2019) which recommended a phase of geophysical investigation took place on the site

2.3. The Gwynedd Archaeological Planning Services have also recommended that either a programme of geophysical and trial trenching or that archaeological mitigation takes place over all ground works (Letter from T. Fildes dated 25th August 2021)

2.4. In his letter Fildes states that "the periphery of the town does hold potential for unknown archaeological sites. The Tithe Map suggests early variations on the field's composition, as well as being in proximity to an early (possibly even Medieval) farmstead to the south. The route of the A497 is the route of the original track in and out of Criccieth to the west, meaning that roadside sites such as this hold particular potential for associated activity." Thus, his recommendation for further work.

3. Objectives

3.1. The principal objectives of the proposed geophysical survey are as follows:

3.1.1. To record any geophysical anomalies within the survey area which may be related to archaeological activity.

4. Fieldwork Program

4.1. A program of field work is proposed for this area that will include:

4.1.1. A fluxgate gradiometer survey

4.1.2. Archive preparation

4.1.3. Report preparation

5. Methodology

5.1. Fluxgate Gradiometer Survey

5.1.1. The survey areas will be gridded with a 20 x 20 m grid. These squares will be marked by plastic pegs.

5.1.1.1. The possible location of the survey area is shown on Figure 2. This is based on the topographic survey YTC-AGA-XX-XX-DR-A-002 by Ainsley Gommon Architects and the GoogleEarth Image.

5.1.1.2. The final position and orientation of the grid will be decided on site.

5.1.2. The grid will be tied to local features

5.1.3. Geoscan FM 256 Fluxgate Gradiometer will be used for the survey

5.1.4. Readings will be taken at 0.25 m intervals along transects 1.0 m apart with a zig-zag pattern being walked

5.1.5. The data will be downloaded on to a laptop computer in the field

5.1.6. The data will be analysed using Geoplot v. 4.00

5.1.7. Grey scale plots will be produced using Geoplot v. 4.00

5.1.8. X - Y plots will be produced using Golden software "Surfer" v. 10

5.1.9. If possible, a limited number of small soil samples will be taken for magnetic susceptibility analysis as an aid to interpret the results of the Fluxgate gradiometer survey.

6. Report and Archive

6.1. On completion of the survey a report shall be produced which will contain:

6.1.1. The results of the geophysical survey

6.1.2. A general location plan of the development

6.1.3. A location plan of the development area identifying the location of the geophysical survey.

6.1.4. A detailed description of the anomalies recorded, their possible interpretation character, function, date and relationship to other features.

6.1.5. Recommendations for further work if appropriate.

6.1.6. A bibliography.

6.2. A digital copy of the report will be submitted to the client within one month of the completion of the field work.

6.3. An initial assessment of the geophysical survey will be made available within one working day of the fieldwork

6.4. The digital records will be archived with the Royal Commission on Ancient and Historic Monuments of Wales

6.5. The digital archive will be prepared in line with Royal Commission on Ancient and Historic Monuments of Wales. 2015. Guidelines for digital archives

6.6. The digital file formats used for the archive will follow those recommended within the Royal Commission on Ancient and Historic Monuments of Wales. 2015. Guidelines for digital archives.

6.7. The preparation of the report will conform to the Welsh Archaeological Trusts 2018 "Guidance for the Submission of Data to the Welsh Historic Environment Records (HERs)"

7. Staff

7.1. The project will be carried out by Ian Brooks, PhD, BA, MCIfA., FSA

8. Timetable

8.1. It is intended to carry out the fieldwork between 15th and 16th September 2021

9. General

9.1. CIfA Code of Conduct

9.1.1. All staff will abide by, and all procedures be carried out in accordance with

the Chartered Institute for Archaeologists' Code of Conduct

9.2. Health and Safety

9.2.1. EAS Ltd adopt and adhere to safe working practices at all times.

9.2.2. A copy of the company's general statement of policy is available on request.

9.3. Staff

9.3.1. The project will be directed by Dr I.P. Brooks MCIfA FSA

9.3.2. Project Staff will include Dr I.P. Brooks MCIfA FSA.

9.4. Curatorial Monitoring

9.4.1. The Gwynedd Archaeological Planning Service will be informed as to the start date and progress of the fieldwork.

9.5. Insurance

9.5.1. EAS Ltd carries all necessary Public and Employee Liability Insurances.

9.5.2. EAS Ltd carries Professional Indemnity Insurance

10. Copyright

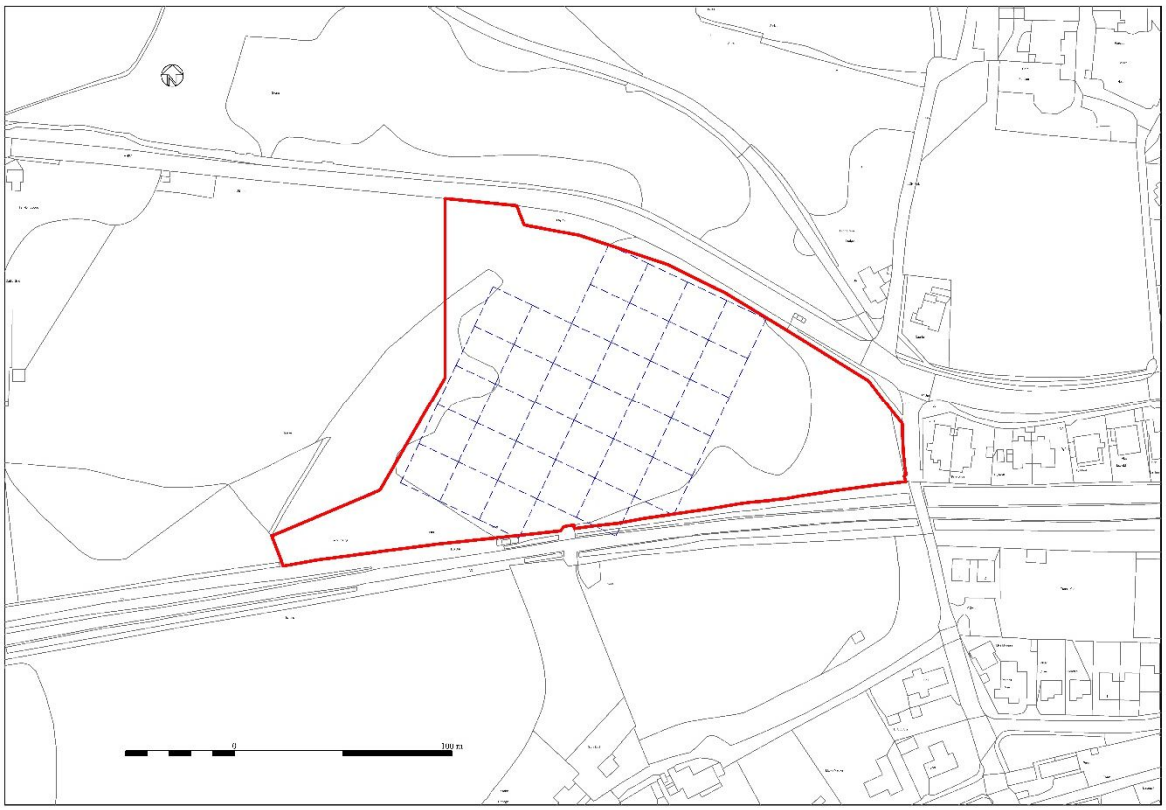
10.1. EAS Ltd shall retain full copyright of any commissioned reports, tender documents or other project documentation, under the Copyrights, Designs and Patents Act 1988 with all rights reserved: excepting that it hereby provides an exclusive licence to the client for the use of such documents by the client in all matters directly relating to the project as described in the Project Specification.

10.2. EAS Ltd is prepared to assign a licence to the client for the use of the report and any associated data.

References

Cooke, R. 2019. Proposed New School Site, A497 / Stryd Fawr, Cricieth, Gwynedd LL52 0RY *Aeon Archaeology Report 0211*

Figure 1: Location



Based on drawing YTC-AGA-XX-DR-A-001 by Ainsley Gommon Architects

Figure 2: Possible survey grid